



*Organizational Results*  
**FY 2008 Research  
Descriptions**

## **Form a line ...**

That's how some research programs are built. The projects are prioritized on a first-come first-served basis. However, at MoDOT we have chosen to take a more robust approach by involving our internal customers and research partners to identify those research projects that will have the greatest impact on MoDOT's ability to achieve its Tangible Results with a special eye toward practical implementation.

During the past three months, Organizational Results staff has been collecting potential research projects throughout MoDOT to address critical performance gaps. The pages that follow give a brief description of those identified for further investigation during FY 2008. The research descriptions are organized by Tangible Result and do not represent a priority order.

As always, we look forward to collaborating with our public and private research partners on each of these projects!

Sincerely,

A handwritten signature in black ink, reading "Mara Campbell". The signature is fluid and cursive, with the first name "Mara" and last name "Campbell" clearly distinguishable.

Mara Campbell  
Organizational Results Director

***Please note: Project descriptions and budgets are only preliminary. Specific details will be available as projects are offered for contract proposals.***

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## **Smooth & Unrestricted Roads And Bridges**

### **Non-Destructive Technologies for Bridge Maintenance Applications**

Estimated Funding: \$75,000

Duration: 18 months

This project will expand MoDOT's effort of pursuing additional non-destructive testing technologies in support of department bridge maintenance activities.

*Benefit to MoDOT: See description above.*

### **Assessment of Strategies to Maintain Regional Mobility During Construction on Interstate 64 in St. Louis**

Estimated Funding: undetermined at this time

Duration: multiple phases

The objectives of this research effort are to provide a before, during and after analysis of the economic dimensions, community issues and regional mobility issues with the construction of the New I-64 Project in St Louis City and county. This research should examine the impacts and success of the New I64 project contracting, design and execution through measures of economic impacts and benefits, community connectedness, and mobility measures, at the personal, community and regional levels.

*Benefit to MoDOT: This project will help MoDOT identify successful strategies to deploy on future projects.*

### **Predictive Congestion Control and Mitigation Using Wireless Sensor Networking**

Estimated Funding: \$150,000

Duration: 24 months

This project will develop a distributed predictive congestion control scheme based on travel and congestion indices using wireless sensor networking.

*Benefit to MoDOT: This project will improve traffic flow, reduce congestion, and improve safety.*

### **Automatic Traffic Monitoring and Incident Management**

Estimated Funding: \$50,000

Duration: six months

This project will investigate infrastructure issues, data collection and storage, and data analysis methodologies through on-line monitoring and management of traffic infrastructure.

*Benefit to MoDOT: This project will provide a low-cost, near-term solution that will facilitate real-time monitoring of traffic congestion and incidents.*

**Improved Traffic Flow Through Optimization of Signal Timing**

Estimated Funding: \$50,000

Duration: 12 months

This project will optimize traffic signal timings on congested urban streets to maximize traffic flow; coordinate traffic signals on congested corridors based on real-time traffic data.

*Benefit to MoDOT: This project will improve traffic flow, reduce congestion, and improve safety.*

**Improved Concrete Durability Factor Test Duration Time**

Estimated Funding: \$60,000

Duration: 12 months

This project will improve durability factor test duration time by establishing a relationship between the Durability Factor (DF) and various quickly determined factors of which DF is a function.

Changes in MoDOT's concrete pavement acceptance specifications are end-result in nature. Concrete will be accepted, in part, on the results of the Durability Factor [DF] (AASHTO T 161) determination from concrete sampled on-site. Unfortunately, the test duration is quite lengthy, and results may lag construction progress so much that mid-course corrections would be impossible to achieve in a timely manner. Miles of concrete could be placed, be out of specification, and no one would know for several months. This could be achieved by being able to compute an approximation of DF that could be determined within a short time after sampling.

*Benefit to MoDOT: This project will help MoDOT avoid assessing penalties for removal of unacceptable concrete pavement after it has been placed.*

**Improve Deleterious Materials Test Method**

Estimated Funding: \$29,000

Duration: 12 months

This project will establish a relationship between the deleterious materials test and various quickly determined objective tests.

*Benefit to MoDOT: This project will provide a more objective test method.*

**Accelerated Pavement and Bridge Construction Techniques - Phase I**

Estimated Funding: \$60,000

Duration: 12 months

This project will identify rapid/accelerated roadway and bridge systems for use in Missouri and identify environmental impacts of various construction alternatives.

*Benefit to MoDOT: This project will accelerate construction, which will minimize traffic disruption and congestion while improving safety and reducing environmental impacts.*

**Evaluation of Fiber Optic Sensors for Remote Health Monitoring of Missouri Bridges**

Estimated Funding: \$100,000

Duration: 12 months

This project will study the validity and cost-effectiveness of fiber optic sensors for infrastructure health monitoring purposes and develop guidelines for their use in monitoring structural behavior of Missouri bridges.

*Benefit to MoDOT: This project will improve bridge safety and maintenance processes.*

**Establishing Performance-Based Moisture Sensitivity Specifications for Asphalt Acceptance**

Estimated Funding: \$75,000

Duration: 24 months

This project will establish a relationship between deleterious materials test-types and moisture sensitivity acceptance threshold limits. It will also establish moisture sensitivity threshold limits for the loaded wheel testing method.

*Benefit to MoDOT: This project will aid both MoDOT in the adherence to specifications and the industry in meeting those specifications.*

**Assessment of Strategies to Maintain Regional Mobility During Construction on Interstate 29 in Kansas City**

Estimated Funding: undetermined at this time

Duration: multiple phases

The objectives of this research effort are to provide a before, during and after analysis of the economic dimensions, community issues and regional mobility issues with major construction on Interstate 29 in Kansas City. This research should examine the impacts and success of the project contracting, design and execution through measures of economic impacts and benefits, community connectedness, and mobility measures, at the personal, community and regional levels.

*Benefit to MoDOT: This project will help MoDOT identify successful strategies to deploy on future projects.*

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## **Safe Transportation System**

### **Effects of Police Car Decoys and Drone Radar on Work Zone**

#### **Compliance**

Estimated Funding: \$50,000

Duration: 12 months

This study will evaluate the use of police car decoys and/or drone radar to reduce vehicle speed in a variety of work zone applications, but with special interest for high-speed roadways where reduced speed limits are imposed by regulation. If proven effective, police car decoys and/or drone radar will be added to the tools available to highway agencies in enhancing safety in work zones on higher speed roadways.

*Benefit to MoDOT: This project will develop police car decoys and drone radar to improve work zone safety.*

### **Increasing Seat Belt Use in Younger Drivers**

Estimated Funding: \$75,000

Duration: 12 months

This project will review and develop alternate strategies to increase belt use among younger drivers. The effectiveness of the Battle of the Belt program will also be assessed.

*Benefit to MoDOT: See description above.*

### **Safer Work Zones in Missouri – Phase I and II**

Estimated Funding: \$150,000

Duration: 15 months

In cooperation with the MoDOT Work Zone Quality Circle, this project will develop analytical tools to improve work zones.

*Benefit to MoDOT: This project will reduce congestion and improve safety in and around work zones.*

### **Impacts of Public Policy Changes for Safety**

Estimated Funding: \$45,000

Duration: 12 months

This project will evaluate policy or legislative changes that have been put in place to determine their effectiveness. Specific needs statements for certain policies will be developed to carry out this evaluation. Examples include, zero tolerance, graduated drivers license, helmet law repeal and others. The development of the changes will depend on legislative action.

*Benefit to MoDOT: This project will help MoDOT understand the effects of public policy changes related to safety.*

**Understanding Relationship Between CMV and Fatal Accidents**

Estimated Funding: \$20,000

Duration: nine months

Besides the obvious size and weight differences of CMV and passenger cars, this project will assess other aspects of CMV operation that lead to fatal crashes with other vehicles.

*Benefit to MoDOT: This project will help MoDOT understand of this issue regarding commercial motor vehicles to guide policy and department decisions.*

**Evaluation of Pilot Cars in Work Zones**

Estimated Funding: \$50,000

Duration: 12 months

This project will investigate the use of pilot cars to be used in one-lane and two-way work zones when transitioning from work zone device setup to fully operational work zone.

*Benefit to MoDOT: This project will improve work zone safety at the critical transition period from setup to operation.*

**Leverage Transportation To Advance Economic Development****Impacts of Tax Structure, Safety Policy and Operating Policy on Interstate Rail and Air Development**

Estimated Funding: \$35,000

Duration: eight months

Tax structure along with a variety of state-based regulations and laws combine with private sector market incentives to make a state attractive or less attractive for the conduct of business. This study is intended to catalogue and assess tax approaches, laws, policies, - essentially any regulatory infrastructure used by the states and Missouri that either encourages or discourages additional rail and air service and infrastructure.

*Benefit to MoDOT: Based on this analysis, Missouri can develop a business and transportation regulatory climate that is favorable to rail and air related development.*

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## **Fast Projects That Are Of Great Value**

### **Geotechnical Advancement**

Estimated Funding: \$75,000

Duration: 24 months

This project will focus on design options and cost-benefit analysis for the design and construction of steeper slopes. Focus may also be on using geophysical techniques to locate subsurface voids, delineate depth to bedrock and determine soil stiffness properties for earthquake ground response. Geophysical technologies offer potentially reliable methods to provide subsurface information, which could lead to more economical and reliable design, better earthquake resistance and fewer project delays.

*Benefit to MoDOT: This project will further advance MoDOT design of geotechnical features and application of geotechnical technology for more reliable subsurface investigation.*

## **Environmentally Responsible**

### **Survey of Landowners with Close Proximity to MoDOT Wetlands**

Estimated Funding: \$35,000

Duration: eight months

This survey will focus on landowners in close proximity to MoDOT compensatory wetlands. The survey will assess the perceived impact of constructed wetlands on property values, environmental considerations such as odors, waterfowl and insect nuisance, as well as the benefits, and economic development opportunities associated with natural features. Anecdotal comments of Missouri landowners reflect dissatisfaction with wetlands near their property, but others express appreciation for the natural features. Further, land values tend to show positive benefits when located in proximity to natural features.

*Benefit to MoDOT: This project will provide an assessment of landowner perceptions of wetlands that can then be addressed in public involvement and wetland mitigation design.*

### **Verification of GIS-Based Archeology Site Locations**

Estimated Funding: \$75,000

Duration: 12 months

In coordination with DNR, MoDOT worked to create a database of over 15,000 archeology sites in the state. Awareness of these sites and their significance is imperative to environmental screening and undertakings. After working with the database, MoDOT has determined that information concerning sites listed in the database often requires reanalysis by in-house archeologists in order to verify the data. The services of a professional archeologist are needed to screen the records in the database to ensure accuracy before full implementation of the database in daily operations.

*Benefit to MoDOT: This project will provide immediate access to and accurate archeological database to facilitate project scoping and development.*



## **Efficient Movement Of Goods**

### **Techniques, Equipment and Strategies to Maximize Navigation on the Missouri River in Low-Flow Situations**

Estimated Funding: \$55,000

Duration: 10 months

Navigation, freight and commodity shipping on the Missouri River are chronically constrained due to low-flow water conditions. More and more, the industry standards, equipment and strategies in the U.S. barge industry do not work on the Missouri River. As a result, these low-flow conditions not only shorten the overall navigation season, but also drive customers to other modes.

The objectives of this project are to identify and review low-flow industry trends, equipment and strategies used in inland navigation settings that may be transferable to the Missouri River. Modal integration with these alternatives should also be considered. This review should draw from both domestic and international industry practices.

The project is also expected to document and identify efficiencies and inefficiencies with these alternatives, as they would be implemented on the Missouri River, and given the existing and potential commodity movement on the river. The economic feasibility and break-even point of these low-flow alternatives should be documented so that navigation proponents can identify the economics of adopting alternative, low-flow techniques, equipment and strategies. Finally, and as appropriate, implementation and marketing approaches to encourage adoption of low-flow technologies should be identified based on the findings of this research.

*Benefit to MoDOT: The need for modal integration and increased use of alternative modes for freight and commodity movement are increasing at rapid rate. Given re-occurring low-flow conditions on the Missouri River, this project will develop a baseline of information and awareness to assist the barge and logistics industries in determining the potential alternatives they can use in shipping. Missouri then may see greater utilization of this river resource, and a spread of freight and commodity shipment among modes.*

## **Easily Accessible Modal Choices**

### **Needs Assessment for Rural Transit Service**

Estimated Funding: \$40,000

Duration: 10 months

The purpose of this project is to establish demand schedules for rural transit service as a means to better match funding with actual needs. MoDOT's current measure of rural transit service is the average number of days of service per week with an implied goal of five days of service per week. However, field experience has demonstrated that MoDOT's efforts are more effective if staff understands where and when the service is actually needed, rather than apply a generalized goal of five-days a week service. This research asks: Where are the actual needs for transit in the rural areas across the state? Is MoDOT serving all of the potential population of users? Are there those with needs besides the traditional healthcare and shopping users? Can community typologies be used to classify areas based on transit needs?

*Benefit to MoDOT: As MoDOT better understands rural transit needs it will be able to effectively provide the needed services. With better understanding of transit demand, MoDOT will be able to provide the best transit schedule and services for the each dollar invested.*

### **Identification and Minimization of Approach Slope Constraints at Missouri's General Aviation Airports**

Estimated Funding: \$45,000

Duration: 12 months

This project is designed to use remote sensing technologies to establish vertical elevation models at Missouri's 116 general aviation airports. Based on this analysis, approach slope constraint maps will be developed that identify approach slopes at airports that limit use of the airport in reduced visibility conditions.

*Benefit to MoDOT: As these approach constraints are identified, plans and funding can then be secured to correct problematic approaches to ensure that general aviation airports are available for flights on a more consistent basis.*

### **Identification of Opportunities to Increase Ride Share and Car Pooling in Missouri**

Estimated Funding: \$20,000

Duration: six months

This project is designed to identify constraints and the corollary opportunities to increasing vehicle occupancy rates and then reducing the number of vehicles on the road. This project will especially focus on incentives and disincentives for road users driving during peak travel times to maximize benefits.

*Benefit to MoDOT: This project should provide increased awareness of ride sharing and its potential impact on traffic congestion.*

**Best Value For Every Dollar Spent****Alternative Fuel Performance/Economics/Quality Usage**

Estimated Funding: \$20,000

Duration: 10 months

This project is to review flex-fuel (E-85) and issues associated pricing, availability, fuel efficiency and the impact it has on MoDOT's fleet. This project is related to flex fuels and an enhancement to the biodiesel project (RI06-045) except with the target fuel (E-85).

*Benefit to MoDOT: This project will help MoDOT in decision related to the use of E-85 fuel in its vehicles.*

**Employee Perceptions and Preferences of Health Benefits**

Estimated Funding: \$40,000

Duration: eight months

Costs for MoDOT's health benefits and plans are increasing and both the employer and employees are impacted by the overarching changes in MoDOT's health care system. Given the changes in benefit provision and health care services over the last ten years, a survey of employees and their experiences, satisfaction and preferences with the MoDOT health care benefits packages is proposed.

*Benefit to MoDOT: Information from this survey can ensure that health benefits staff are informed of employee satisfaction, concerns and future expectations.*

**Customer Satisfaction and Economic Benefits of the Motor Carrier Services Software Investment**

Estimated Funding: \$20,000

Duration: six months

This project will evaluate the perceptions and expectations of the motor carrier industry toward MoDOT's MCS software investment.

*Benefit to MoDOT: See description above.*

## **Attractive Roadslides**

### **Development of a Roadside Vegetation Monitoring System: Controlling Problem Weeds in Missouri**

Estimated Funding: \$49,000

Duration: 10 months

Currently, MoDOT has no efficient or accurate method of tracking roadside vegetation. This proposal should lead to a method, which combines the knowledge of the biology and weed management, with remote sensing technology and satellite imagery to evaluate the effectiveness of managing invasive plants populations such as teasel.

*Benefit to MoDOT: Given the scale of common problems weeds such as teasel, this approach will allow for large-scale monitoring of plant populations in response to specific management regimes. Effective management strategies can then be replicated to accelerate the control of noxious weeds.*

## **Accurate, Timely, Understandable & Proactive Transportation Information (Outbound)**

### **Qualitative Assessment of the MoDOT Web Site**

Estimated Funding: \$25,000

Duration: three months

In one sense, MoDOT is able to measure the effectiveness of its web site by counting the number of visits and what pages are explored. This measure does not provide an understanding or guidance concerning the potential of this communication tool. This project is intended to determine what rating system or method already exists or can be created to measure the qualitative dimensions of the MoDOT web site. The project should answer the following questions: Is there an appropriate rating system that MoDOT can use to assess the aesthetics, color, and functionality of the web site and content? How well does the MoDOT site provide context, and does the site follow accepted practices? In addition to providing the right information, is MoDOT providing this information in a manner that makes it desirable and easy to use?

*Benefit to MoDOT: Ultimately this information can be used to make the MoDOT web site more inviting and easier to use; increasing its role as a communication tool for MoDOT.*